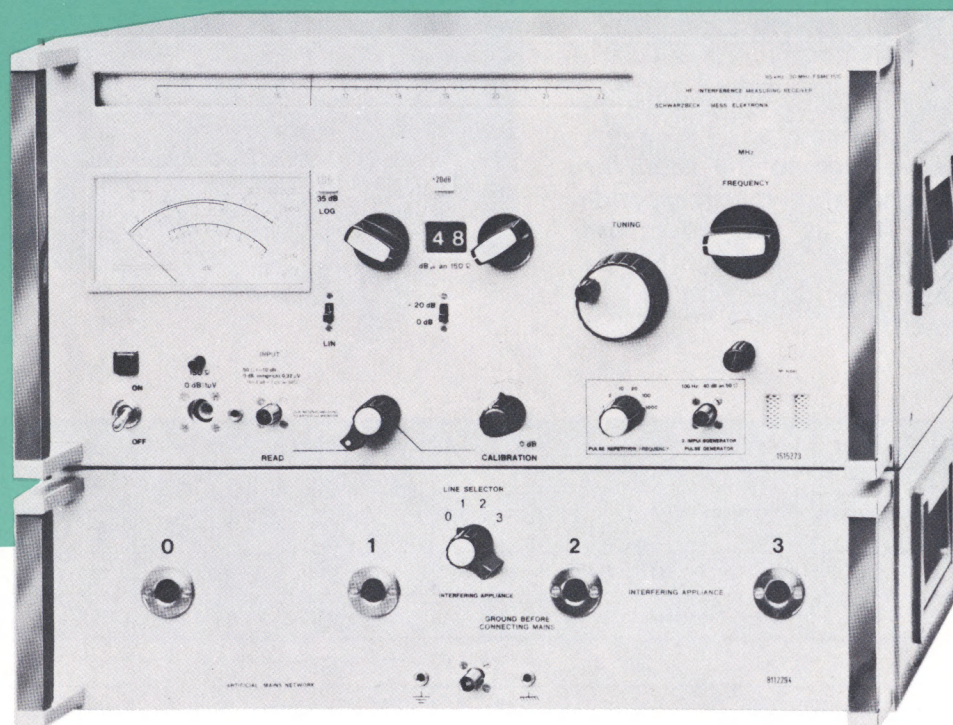


RFI-EMI INTERFERENCE MEASURING INSTRUMENTS (CISPR & VDE SPECIFICATIONS)



For several decades problems of EMC, EMI & RFI are well known. Communications authorities and manufacturers in many countries have set standards & limits for conducted and radiated electromagnetic energy to protect radio services. Meanwhile the problems have spread to non-communication applications. Modern digital equipment is sensitive to pulses. Proper operation of electronic data equipment may be disturbed by interference.

For protection of Radio and TV communications, most world countries have adopted the C.I.S.P.R. method of interference measurement. Specifications may be obtained from: Bureau Central de la Commission Electrotechnique Internationale, One rue de Varembe; Geneve; Switzerland.

In many countries national regulations exist, compatible with CISPR, dealing with the receiver, line networks, and antennas. In Germany, the VDE (Verband Deutscher Elektrotechniker) has issued regulations VDE 0871 - 0879. These are available from VDE - Verlag; I Berlin; W. Germany.

Broadband Interference is generated by pulses of short duration or rise times. Such pulses exist where sparks are generated, and where dc or sine waves are periodically interrupted. Interference may be distributed by conduction along the power line and may also be radiated with a predominant magnetic or electrical field component.

Measuring broadband and mixed interference signals requires special receivers conforming to critical specifications, especially Quasi-Peak Measurements, as prescribed by C.I.S.P.R.

Interference at the terminals of equipment is measured by inserting Line Impedance Stabilization Networks (LISN) which provide constant or defined impedance at the sample terminals and rejects external power line interference.

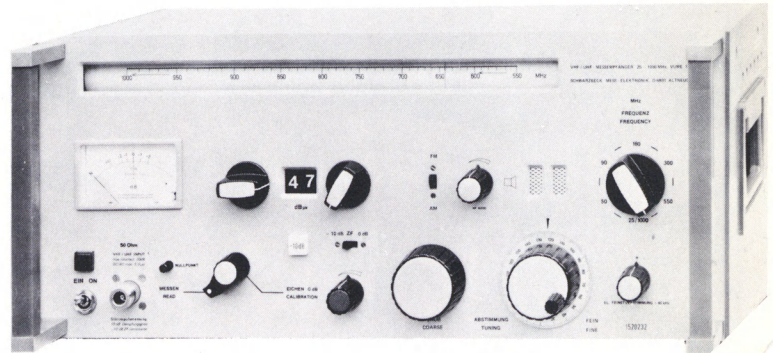
To avoid field intensity measurements, often inconvenient, the Absorbing Clamp has been developed as a power pick-up device for measurements in VHF/UHF frequency ranges.

SCHWARZBECK

MEASURING RECEIVERS

CISPR specifications define bandwidth, a peak detector with a defined charge and discharge time constant, and a high linearity range - more than 30 dB (CISPR 1) or 43 dB (CISPR 2 and 4) beyond the sine wave meter range at the stage preceeding the detector. These qualifications result in a meter indication dependent on pulse repetition frequency.

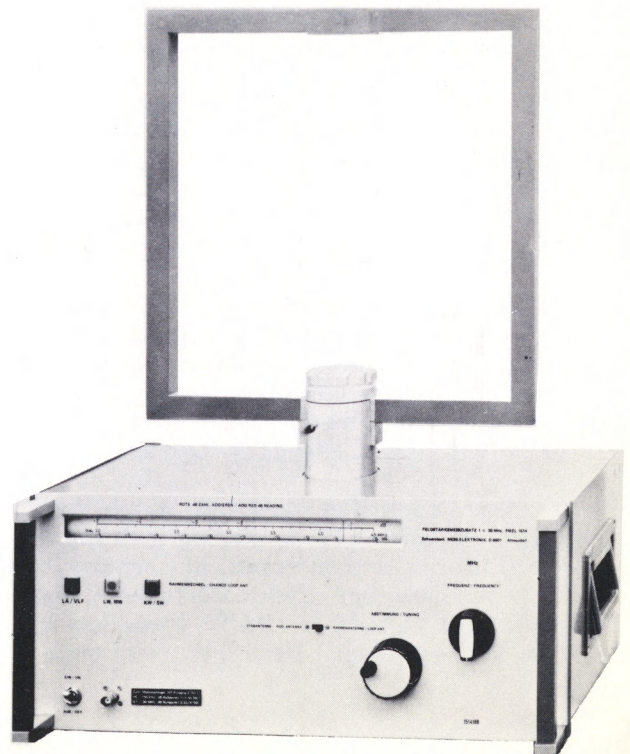
Measuring single pulses is easily accomplished with the Schwarzbeck receivers. However, since the input pulse voltage to the receiver can be 10,000 times higher than a corresponding sine wave input. This is why spectrum analyzers and receivers not specifically designed for CISPR quasi-peak detection fail to give useful measurements.



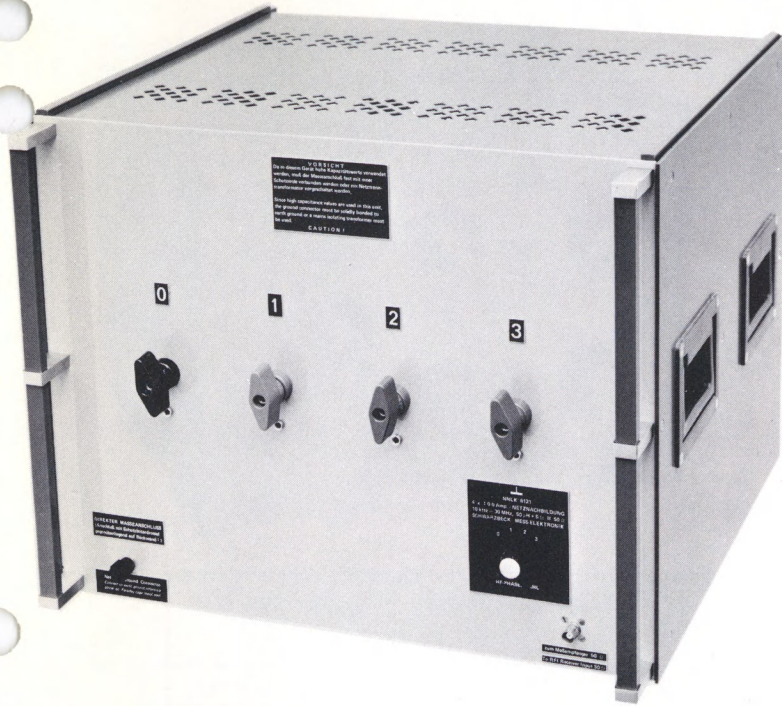
TYPE	CISPR	FREQ. RANGE	RANGES	MEAS. RANGE	ACCURACY	Z Ω
LSME 1530	3	10 - 150 kHz	3	-10 to + 100 dB	+ 1.0 dB	50
FSME 1515	1	.08 - 30 MHz	9	0 to + 120 dB	+ 0.5 dB	50/150
VSME 1510	2	30 - 300 MHz	6	0 to + 100 dB	+ 1.5 dB	50
VUME 1520	2&4	25 - 1000 MHz	6	0 to + 110 dB	+ 1.5 dB	50

FIELD STRENGTH MEAS. SETS

When used with Type FSME 1515 HF CISPR Receiver, these sets measure both magnetic and electric Field Strength from 0.3 $\mu\text{V}/\text{m}$ to 10 mV/m covering the range 85 kHz - 30 MHz (10 kHz - 30 MHz with Type FMZL 1514). Set supplied with 2 calibrated loop antennas (3 for FMZL) + 1 calibrated rod antenna.



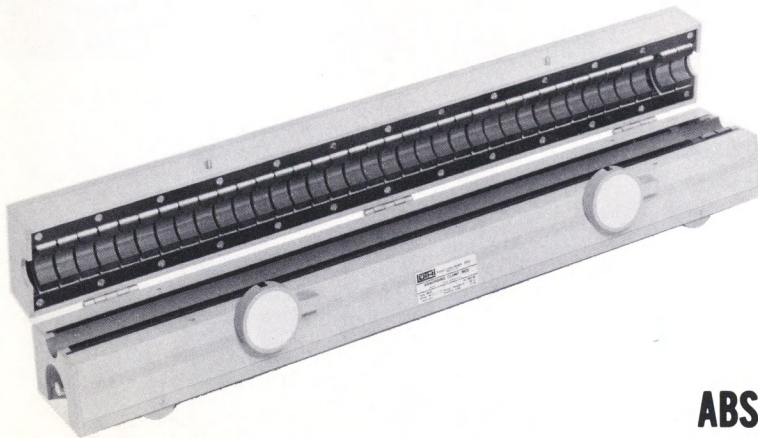
POWER LINE INTERFACES LISN & MDS



Two generally different types of LISN's are used. CISPR calls for a constant 150 ohms impedance in the HF range. This is an unrealistic value considering modern power line impedances. So for the LF range, both CISPR and MIL recommend a lower impedance with frequency-dependent configuration. The low frequency impedance is determined by a series 5 ohm resistor; whereas the impedance approaches 50 ohms at HF. These models are indicated by " * " in the following table.

LISN's are available with current ratings from 6 amps to enable testing of small power tools up to 400 amps for testing automotive and shipboard applications.

TYPE	CISPR	FREQ. RANGE	CURRENT RATING	Z	CABLES REQD.
NNLA 8119	3	10 - 150 kHz	2 x 10 A.	50 Ω *	HFK 9522
NNLA 8120	3	10 - 150 kHz	4 x 25 A.	50 Ω *	HFK 9522
NNBM 8112	1	.15 - 30 MHz	4 x 25 A.	150 Ω	HFK 9502
NNBM 8114	1	.15 - 30 MHz	2 x 6 A.	150 Ω	HFK 9501
NNBM 8116	1	.15 - 30 MHz	2 x 6 A.	150 Ω	HFK 9501
NNLK 8121	3	.01 - 30 MHz	4 x 100 A.	50 Ω *	NA
NNB 8123	1	.15 - 30 MHz	1 x 400 A.	50 Ω *	NA
UNN 8122	2	20 - 300 MHz	4 x 25 A.	50 Ω	VHK 9511



ABSORBING CLAMPS

TYPE	FREQ. RANGE	MAX. CABLE DIAM.
MDS - 9	30 - 300 MHz	11 mm
MDS - 20	30 - 300 MHz	20 mm
MDS - 21	30 - 1000 MHz	20 mm

CALIBRATORS

All EMI & CISPR Receivers are calibrated preferably with pulse signals. This calibration is always referred to the rms value of a sine wave giving the same meter indication. Since 1/3 of the pulse spectrum can be considered to be flat, this means sub-nanosecond pulses must be used to calibrate a receiver up to 1 GHz.

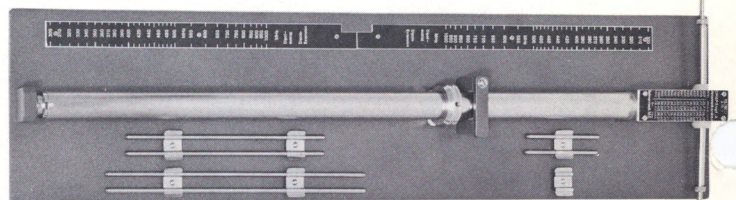
Schwarzbeck offers a complete line of Calibration Generators to fulfill customer requirements in assuring that their receivers are within the stringent CISPR specifications.



TYPE	CISPR	PRF (Hz)	PULSE DURATION	LEVEL dB (uv)	FEATURES
IGS 2902	1	.2 - 1000	9 ns	70 dB	Aux. Sine output
IGSS 2903	1,2,3	1 - 10000	-	Per CISPR - 10 dB	Direct CISPR Cal. outputs
IGUF 2910	2	250	.5 ns	80 dB (600 V)	Battery powered
IGU 2912	2 & 4	1 - 200	250 ps	0 - 60 dB (100 V)	Covers 0 - 1 GHz
IGM 2913	1 & 3	-	-	0 - 70 DB	High Level Calib.
IGUS 2915	1,2,3	1 - 200	.5 - 100 ns	0 - 100 V (300 V)	Gen. Purpose EMC Calibrator

ACCESSORIES

Schwarzbeck offers many accessories to provide greater flexibility and convenience.



TYPE	DESCRIPTION
LK 9901	Lockable Receiver Transit Case
-	Ni Cd Battery/Charger System
-	DC Recorder Outputs (Level & Freq.)
TK 9415-17	Interference Meas. Probes 150, 1500, 2500 ohms
VHAP/UHAP	Precision Calibrated VHF & UHF Dipole Antennas; Transmit & Receive
AK 9104	Antenna Mast System

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April 1, 1980

Schwarzbeck Interference Meas. Equipment For FCC, CISPR & VDE Standards

<u>TYPE</u>	<u>DESCRIPTION</u>	<u>PRICE</u>
LSME 1530	VLF Interference Meas. Receiver; 10-150 kHz; CISPR 3	11300
NNLA 8119	VLF Art. Line Network (LISN); 2 x 10 amp, 10 kHz - 30 MHz	2450
NNLA 8120	VLF Art. Line Network (LISN); 4 x 25 amp, 10 kHz - 30 MHz	3700
HFK 9522	Connecting cable; network to receiver	50
FMZL 1514	Field Intensity Meas. Set; 10 kHz-30 MHz; 3 Loop + Rod Ant. (used with Types LSME 1530 & FSME 1515)	9350
FSME 1515	HF Interference Meas. Receiver; 0.08-30 MHz; CISPR 1	13600
NNBM 8112	Std. Artificial Line Network, V-type, 4 x 25 amp, 150 ohms	2600
NNBM 8114	Art. Line Network, German Receptacle; 2 x 6 amp. 150 ohms	1800
NNBM 8116	Delta-Network; 2 x 6 amp; German Receptacle; 150 ohms	2400
NNLK 8121	Art. Line Network; 4 x 100 amps; CISPR 3 (to 30 MHz)	6600
HFK 9500	Connecting cable; network to receiver (FSME 1515); 1 m	50
HKF 9502	Cables for connecting test item to network; 25 amp; 0.5m	55 ea.
TK 9415	Probe for Meas. Interference Voltage at Terminals; 150 ohms	355
TK 9416	(Same as TK 9415; except 1500 ohms)	355
TK 9417	(Same as TK 9415; except 2500 ohms)	355
FMZ 1514	Field Intensity Meas. Set; 0.08-30 MHz; 2 Loops + Rod Ant. (used with Type FSME 1515)	8550
VSME 1510B	VHF Interference Meas. Receiver; 30-300 MHz; CISPR 2	15700
VSME 1510C	(Same as VSME 1510B, except very high shielding for high external fields).	16700
UNN 8122	VHF Art. Line Network; 4 x 25 amp; 50 ohms; V-network	2250
VHK 9511	Cables for connecting test item to network; 1 m long	65 ea.
VHK 9512	Connecting cable; network to receiver	70
MDS 9	VHF Absorbing Clamp for Cables up to 11 mm Diameter	3050
MDS 21	VHF/UHF Absorbing Clamp; 30 - 1000 MHz	2900
VUME 1520A	VHF - UHF Interference Meas. Receiver; 25-1000 MHz	26600

<u>TYPE</u>	<u>DESCRIPTION</u>	<u>PRICE</u>
DG 9550	Atten. 10 dB; 0-1 GHz; 50 ohms; Type N; for VUME	325
AM 9104	Mast System; Detachable; 0.4-4 m Ht. for VHA & UHA	3000
TT 9150	Storage/Transit Case for AM 9104 & Antenna Parts	400
VHA 9103	VHF Std. Dipole Antenna; 30-300 MHz; with 2 Dipoles	1300
UHA 9105	UHF Std. Dipole Antenna; 300-1000 MHz	1300
BBA 9106	VHF Double Cone Broadband Antenna; 30-300 MHz	650
UHALP 9107	UHF Log-Periodic Broadband Antenna; 300-1000 MHz	1700
VHAP	Precision Cal. Dipole with 10 dB Attenuator; 30-300 MHz	2000
UHAP	(Same as VHAP, except for 300-1000 MHz)	2000
AK 9513	Antenna Cable; 10 m; Type N Connectors	135
IGUF 2910	High Power Pulse Gen.; Battery Operated; 80 dB; CISPR 2	2950
IGU 2912	VHF-UHF Cal. Pulse Gen.; 25-1000 MHz; 60 dB; CISPR 2	5850
IGS 2902	HF Cal. Pulse Gen.; 0.1-30 MHz; 1 mV Sinewave; CISPR 1	5400
IGSS 2903	Pulse Cal. Gen.; for CISPR 1,2&3; No Sinewave Output	6050
IGUS 2915	EMI Pulse Gen. for General Usage; Pulse Duration 0.4-100 ns	5850
IGM 2913	High Level Pulse Gen.; 0.1-30 MHz; max. 70 dB	5850
MGLK 2115	Signal Gen. for Cal. (1 dB steps); 10 kHz-30 MHz	5750
VMS 2113	Signal Gen. for Cal. (1 dB steps); 30-300 MHz	6225
VT5 9560	Fused Input Attenuator for all EMI Receivers	300

OPTIONS

NiCd Battery; 24 V; 2500 mA-hr with Line Charger for Recvs.	950
Gear driven, Precision Potentiometer with frequency-dependent DC output voltage for x-y recorder operation; available on all EMI receivers.	1400
Average Detector (FCC) in addition to quasi-peak detector (CISPR)	700

NOTE:

All receivers and field intensity measuring sets are supplied with heavy-duty padded storage/transit cases.